United States Patent [19]

Knickerbocker

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[45] **Date of Patent: Apr. 8, 1986**

[54] **MODULAR CONNECTING BLOCKS**

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[73] Assignee: **The Siemon Company**, Watertown, Conn.

[21] Appl. No.: **369,197**

[22] Filed: **Apr. 16, 1982**

Related U.S. Application Data

[63] Continuation of Ser. No. 121,797, Feb. 15, 1980, abandoned, which is a continuation of Ser. No. 937,043, Aug. 28, 1978, abandoned, which is a continuation-in-part of Ser. No. 815,270, Jul. 13, 1977, abandoned, which is a continuation of Ser. No. 594,359, Jul. 9, 1975, abandoned.

[51] **Int. Cl.**[4] **H01R 4/24**

[52] **U.S. Cl.** ..... **339/98**; 339/125 R; 339/198 G

[58] **Field of Search** ..... 339/59 M, 97 R, 97 P, 339/98; 99, 198 G, 220 R, 125 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,726,375	12/1955	Gordon	339/198 G
2,753,534	7/1956	Sprigg	339/59 M
3,154,364	10/1964	Gerg	339/198 H
3,409,857	11/1968	O'Neil et al.	339/276 R
3,471,822	10/1969	Van Baelen	339/188 G
3,533,049	10/1970	Thompson	339/99 R
3,605,071	9/1971	Sedlacek	339/97 P
3,636,500	1/1972	Sedlacek	339/97 R
3,702,982	11/1972	Kelly et al.	339/176 MF
3,822,416	7/1974	Haag et al.	339/125 R
3,836,942	9/1974	Knickerbocker	339/97 R
3,851,114	11/1974	Bush et al.	361/346
3,899,237	8/1975	Briggs et al.	339/99 R
3,930,708	1/1976	Wedekind et al.	339/99 R
3,936,119	2/1976	Ayer	339/97 R
3,947,732	3/1976	Cwirzen	339/99 R
4,150,867	4/1979	Knickerbocker	339/97 P
4,152,749	5/1979	Knickerbocker	339/97 R

FOREIGN PATENT DOCUMENTS

2008890	1/1970	Fed. Rep. of Germany	339/97 R

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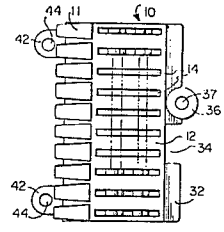
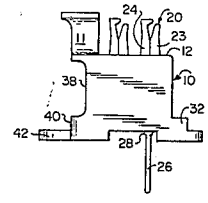
Attorney, Agent, or Firm—Fishman & Dionne

[57] **ABSTRACT**

A modular connecting block comprising a block of insulating material having a plurality of apertures therein, each aperture having inserted therein a plurality of flat elongated conductive elements, the elements including at least one pair of opposing contact fingers which protrude upwardly from and are integral with a base portion of the elements, the contact fingers extending through said apertures to allow for connection of wires to the elements, the elements including a tang which is integral with and extends from the base of the element. The modular connecting block may be prewired and includes a plurality of conductive circuits which connect the tangs to various contact points which are positioned external to the block. In another embodiment of the invention the block comprises a parallelepiped having a projecting edge along the bottom of one longitudinal side thereof. The projecting edge is interrupted at a predetermined distance from one end thereof by a recess and at the same distance from the other end by a securing protrusion. The width of the recess is at least as great as the width of the securing protrusion so that when such two blocks are placed with their projecting edges in face to face contact, the protrusion of one will mate with the recess of the other.

5 Claims, 14 Drawing Figures





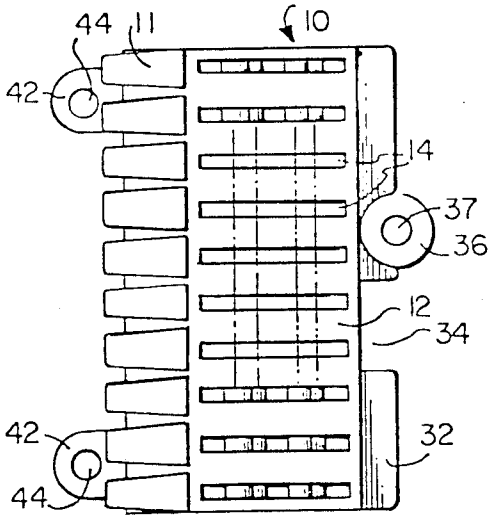


FIG. 1

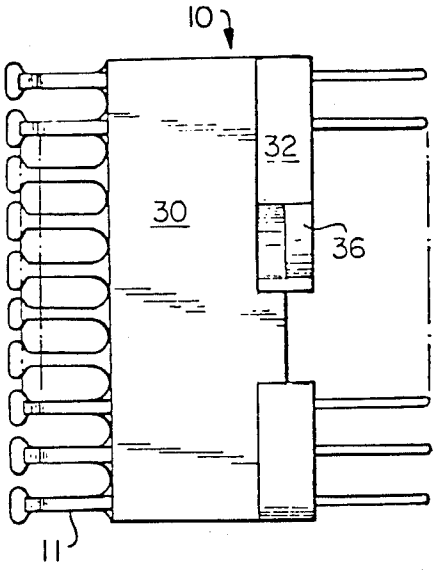


FIG. 2

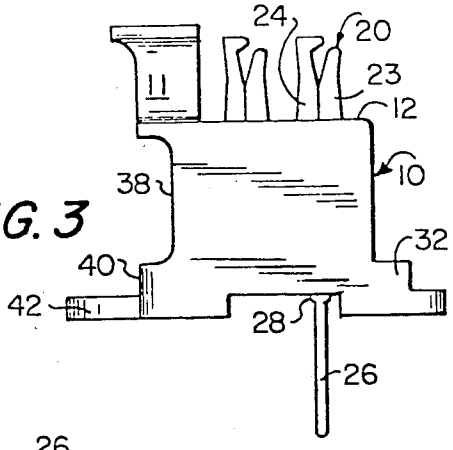


FIG. 3

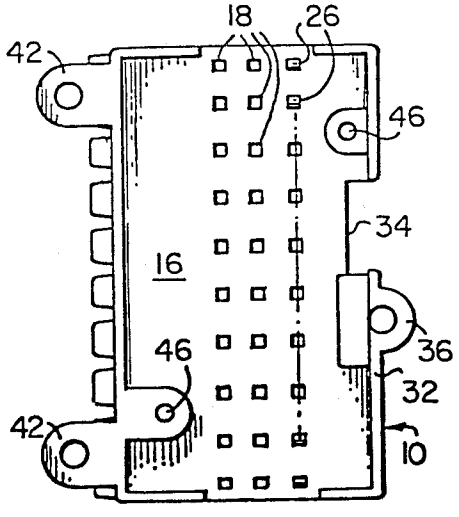


FIG. 4

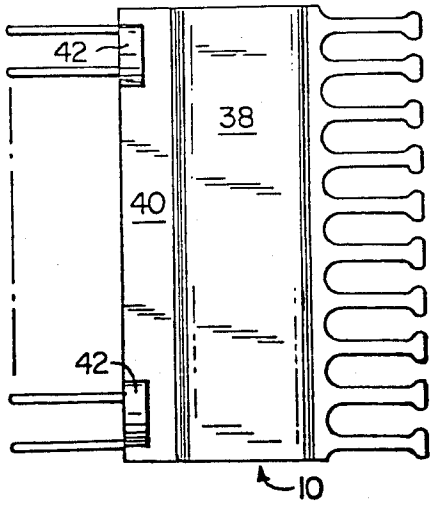


FIG. 5

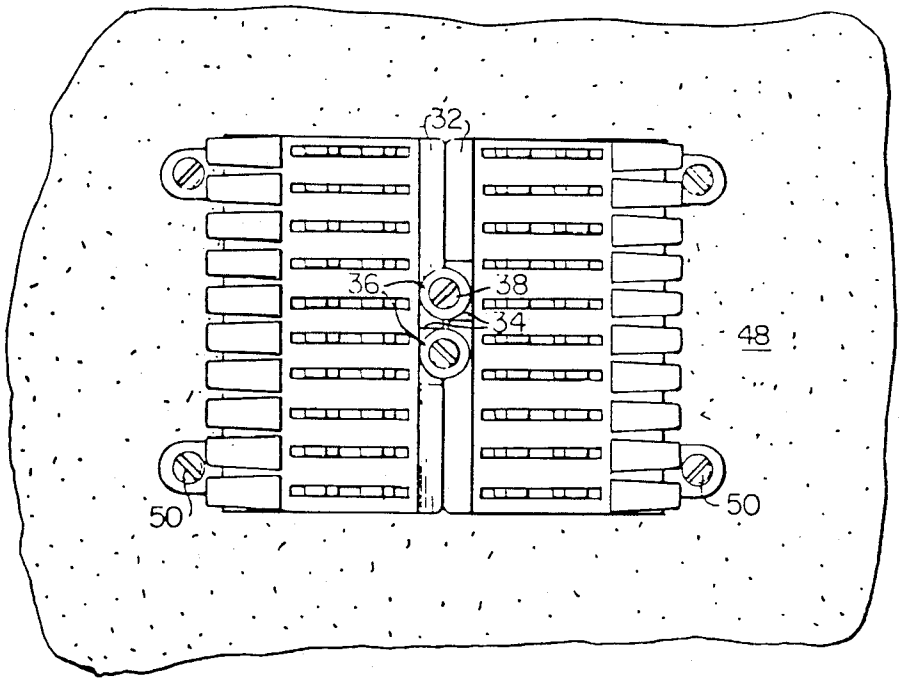


FIG. 6

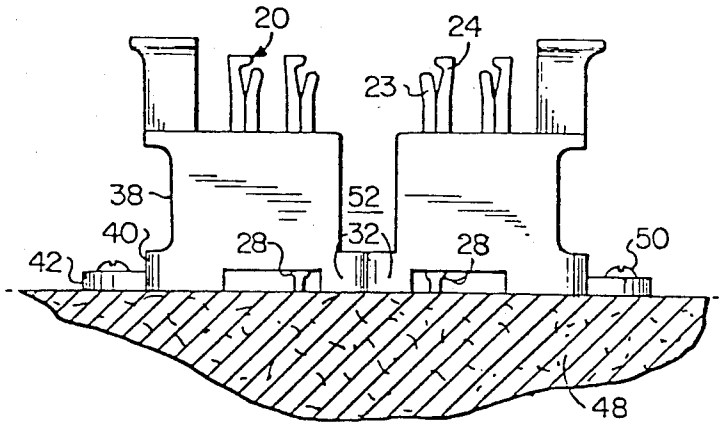


FIG. 7

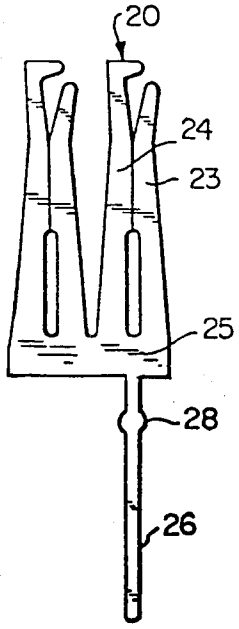


FIG. 8

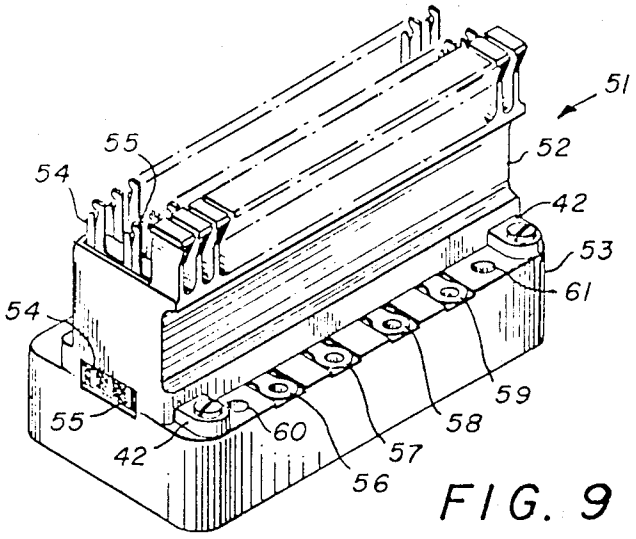


FIG. 9

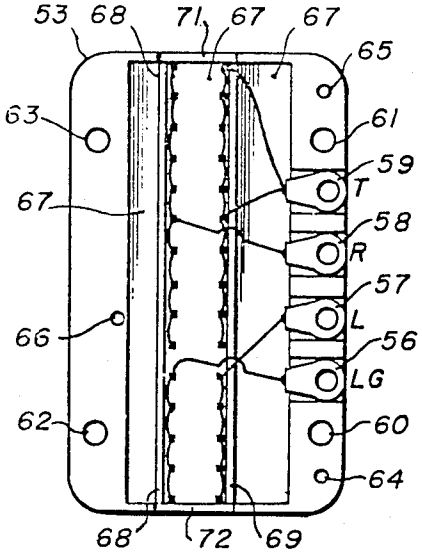


FIG. 10

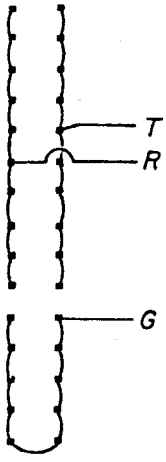


FIG. 11

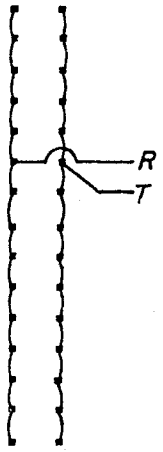


FIG. 12

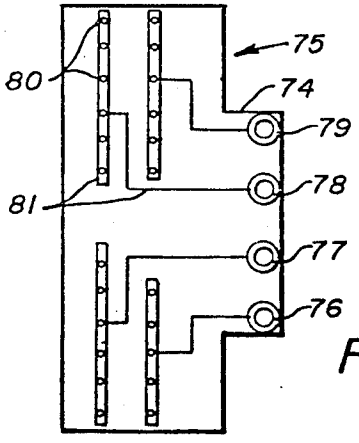


FIG. 13

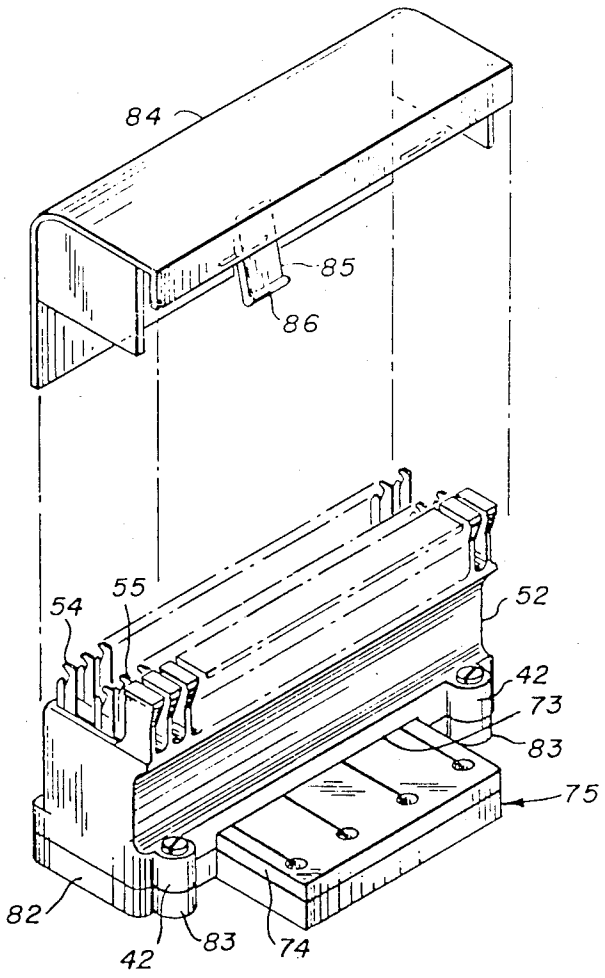


FIG. 14

MODULAR CONNECTING BLOCKS

RELATED APPLICATION

This application is a continuation of U.S. patent application Ser. No. 121,797 filed Feb. 15, 1980, abandoned, which, was a continuation of U.S. patent application Ser. No. 937,043 filed Aug. 28, 1978, abandoned, which, was a continuation-in-part of U.S. patent application Ser. No. 815,270 filed July 13, 1977, abandoned, which was a continuation of U.S. patent application Ser. No. 594,359 filed July 9, 1975, abandoned.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

This invention relates to a modular quick connect terminal block that is small and easily mounted. More particularly, the invention relates to a quick connect terminal block which may be prewired and used as a junction box for telephones.

(2) Description of the Prior Art

Terminal connecting blocks are used extensively in the fields of electronics and communication. For example, they are used by the telephone industry in distribution cabinets for connecting conductors in a cable from an exchange to other conductors extending to various stations within a building. When a number of telephones are connected in a building, the person installing the telephones must connect an outside cable to conductors extending to various telephones within the building. The present method of installing telephones comprises manually securing the various wires in the outside cable to a distribution cabinet associated with the building. The wires from the telephones within the building are also manually connected to the distribution cabinet. In the distribution cabinet, the wires running to the telephones must be connected to the wire from the incoming cable. This type of connection requires a trained telephone installment person who knows which line from the cable to connect to the other lines directed to the telephones within the building. It should be understood that this process of connecting the telephones to the cable via a distribution cabinet is a time consuming task which is desirable accomplished by a skilled technician.

One type of terminal connecting block as disclosed in U.S. Pat. No 3,234,498 comprises a plurality of connector elements arranged in spaced side-by-side rows of terminals in a connector block. Each element comprises a plurality of connectors joined together at a base portion. Each of the connectors is of the insulation penetrating type, i.e., the insulation on an electrical connecting wire is sheared when the wire is inserted in the conductor. U.S. Pat. No. 3,496,552 discloses interfitted conducting block modules containing insulation penetrating clips. The modules are constructed to facilitate piggy-back stacking.

My U.S. Pat. No. 3,836,942, issued Sept. 17, 1974 discloses and claims a separable electrical connector which permits a large number of additional electrical conductors to be connected to a terminal block containing clip-type electrical connectors without increasing the size of the block. The separable connector comprises a flat, elongate, electrically conductive element and a dielectricc retaining member for holding the electrically conductive element in contact with the upper portions of laterally adjacent electrical connectors which project upwardly from a terminal block. The conductive element comprises a flat base portion and at least one, e.g., one or two, pair of opposing contact fingers which project upwardly from the base portion and are integral with the base portion. The adjacent edge portions of the contact fingers are adapted to receive an electrical conductor therebetween. The retaining member comprises a casing which encloses a portion of the electrically conductive element. The top portions of the opposing contact fingers project above the casing so that an electrical conductor may be inserted between the opposing fingers. This device is intended for use only in connection with an already installed connecting block.

It is an object of the present invention to provide a modular quick connect terminal block that may be prewired so that the wires of an incoming cable may be quickly mounted to the block in such a manner that the wires of the cable are associated properly with the various telephones in a building.

It is an object of this invention to provide a modular quick-connect terminal block that is small, easily mounted and can be fit into console wiring where a rack or panel mounted block is very often needed, and which does not require that it be mounted in connection with an already installed connecting block.

SUMMARY OF THE INVENTION

In accordance with the practice of the present invention there is provided a first embodiment of a modular circuit block which includes two parts. An upper block portion comprises insulating material and includes a plurality of apertures therein. Inserted within the apertures are a plurality of flat elongated conductive elements, the elements including at least one pair of opposing contact fingers which protrude upwardly from and are integral with a base portion of the element, the contact fingers extending through said apertures to allow for connection of wires to the elements. The elements also include a tang which is integral with and which extends from the base of the element. The block may be prewired by connecting wires which may be soldered or wire wrapped to the tangs. The wires may be wired to a plurality of contact points which are positioned external to the block so as to allow the contact points to be wired to incoming telephone cable. The second part of the modular circuit block is a base which can be secured to the upper portion of the block so as to protect the tangs and the pre-wired circuitry. The base also includes a plurality of holes which allow the block to be secured to a wall by screws which fit through the holes.

A telephone installation technician installing the aforementioned modular circuit block may carry a number of prewired blocks which are wired differently. The technician will choose a particular prewired block depending upon the desired electrical connection to be made between the flat elongated conductive elements and the wires of the cable. For a technician to install a telephone system, very little time is spent connecting the input wires from the cable to the wires leading to the telephones. Moreover, a home owner may easily connect additional telephones to the flat elongated conductive elements. Since the block is the interface between the telephone company's equipment and the customer owned equipment, the additional phones can be installed by the customer without tampering with telephone company equipment.

The base may be prewired in a conventional manner, that is, including wires soldered or wire wrapped to the tangs. However, in one embodiment of the invention, a printed circuit board is fit within a recess in the upper block portion. The printed circuit board can include a plurality of contact holes through which the tangs protrude when the upper block portion is secured to the base.

In accordance with a second embodiment of the invention, there is provided a modular block composed of a dielectric material containing a plurality of flat, elongated, electrically conductive elements. Each conductive element comprises a flat base portion and at least one pair of opposing contact fingers which project upwardly from the base portion and are integral with the base portion. The adjacent edge portions of the contact fingers are adapted to receve an electrical conductor therebetween. The block comprises a parallelepiped having a projecting edge along the bottom of one longitudinal side thereof. The projecting edge is interrupted at a predetermined distance from one end thereof by a recess therein and at the same distance from the other end by a protruding securing means. The width of the recess is at least as great as the width of the securing means so that when two such blocks are placed with their projecting edges in face-to-face contact, the securing means of one will fit into the recess of the other.

The invention will be more particularly described with reference to the accompanying drawings wherein:

FIG. **1** is a top plan view of a modular block containing a plurality of electrical conductive elements.

FIG. **2** is a front elevational view of the block.

FIG. **3** is an end elevational view of the block.

FIG. **4** is a bottom plan view of the block.

FIG. **5** is a rear elevational view of the block.

FIG. **6** is a top plan view of two interconnected blocks secured to a section of a panel.

FIG. **7** is an end or side elevational view corresponding to FIG. **6**.

FIG. **8** is a side elevational view of one of the flat, elongate electrically conductive elements.

FIG. **9** shows an upper front perspective view of a prewired modular connecting block.

FIG. **10** shows a top plan view of the base shown in FIG. **9**.

FIG. **11** shows a schematic of an alternative circuit connection for the base shown in FIG. **10**.

FIG. **12** shows a schematic of another alternative circuit connection for the base shown in FIG. **10**.

FIG. **13** shows a top plan view of a printed circuit board which can be fitted to the circuit block shown in FIG. **4**.

FIG. **14** shows an upper front perspective view of modular circuit block of the type including a printed circuit board.

DETAILED DESCRIPTION OF THE INVENTION

Turning more particularly to FIGS. **1–5**, there is shown a modular block **10** which may be formed of a suitable dielectric or electrical insulating material such as a phenol-formaldehyde resin or a polyvinyl resin. The block contains a conventional fanning strip **11** which projects upwardly along one longitudinal side of the top **12** of the block **10**. The block **10** contains a number of parallel slots **14** which extend through the main portion of block **10** to but not through the bottom **16**. Registering with each slot **14** are three spaced apart openings **18** which extend through the bottom **16**.

Each of the slots **14** contains one or two first, elongate electrically conductive elements, shown in detail in FIG. **8**. The elements may be constructed of any suitable resilient conducting material such as phosphor-bronze, beryllium copper or other known metal alloy. Each electrically conductive element **20** includes at least one pair of opposing contact fingers **23** and **24** which are joined at one end to a base portion **25**. Each pair of opposing contact fingers **23** and **24** form a pair of mutually opposed edges which shear the insulation from an electrical conductor inserted therebetween. Between these mutually opposed edges and above the base portion **25** are slots.

Extending perpendicular to the base portion **25** is a tang **26**. In the embodiment shown, there is a protuberance **28** on the tang **26** situated just below the bottom of the base portion **25**. The protuberance **28** serves to hold the electrically conductive element tightly in place in the block **10**. Thus, when the electrically conductive element is inserted into the block, the tang **26** is pushed through one of the openings **18** in the bottom **16**. The openings **18** are slightly smaller than the diameter of the protuberance **28** and the plastic surrounding the opening **18** is resiliently deformed as the protuberance **28** passes therethrough. After the protuberance **28** has passed through the opening, the sides of the opening **18** engage the protuberance and hold the conductive element tightly in place. It will be appreciated that this means for securing an electrically conductive element in place may be used in other types of blocks wherein a tang extends through the base of the block such as shown in my co-pending applications Ser. No. 262,495, filed June 14, 1972 and Ser. No. 507,972, filed Sept. 20, 1974.

Rather than have the conductive elements secured in place by means of the protuberance **28**, they may also be held in place by having the openings **18** tightly engage that portion of the tang adjacent the base portion **25**.

The tangs **26** provide tails which may be wire wrapped to allow for electrical connection between the tangs. If a wire wrap tail is not required, tangs **26** may be clipped off at the base or at protuberance **28**. Alternatively, the electrically conductive element **20** may be supplied without tangs **26** in which case the elements **20** may be held in place by frictional engagement with the sides of the slots **14** at the base area at **25**.

In the embodiment shown, the conductive element comprises two pairs of fingers joined together at a common base portion **25**. However, the pairs of fingers may be independent of one another at base area **25** in which case each pair of fingers would have a tang extending from the base portion **25** so that there would then be two rows of tangs independent of each other instead of one as shown in FIGS. **3** and **7**.

Each block **10** contains a longitudinally extending front portion **10**. Extending the length of the front **30** and located at the bottom thereof is a projecting edge **32**. At a predetermined distance from one end of the edge **32** it is interrupted by a recess **34** and at the same distance from the other end of the edge contains a protruding securing means **36** containing a hole **37**. The width of the recess **34** is at least as great as the width of the securing means **36** so that when two blocks **10** are placed with the projecting edges **32—32** in face-to-face contact, the securing means **36** of one will fit into the recess **34** of the other as shown in FIGS. **6** and **7**. As

best shown in FIG. 2, the top of the securing means 36 is spaced below the top of the edge 32 so that when a screw is placed through the hole 37, the head of the screw will not extend above the top of the edge 32.

The back 38 of the block 30 has a projecting edge 40. Near each end of the edge 40 are protruding securing means 42 containing holes 44. The block may be secured to a panel 48, shown in FIGS. 6 and 7, by means of screws 50. When two blocks are placed with their projecting edges 32—32 in face-to-face contact, with the securing means 36 of one fitting into the recess 34 of the other, there is hereby provided a compact interlocking of the two blocks. Above the facing edges 32—32, there is a channel 52 which provides support for and storage space for a conductor cable and/or electrically conductive wires.

The bottom 16 of the block 10 also contains two rear mounting holes 46 for rack mounting. Thus, these holes may be used to mount the modular blocks of this invention on a panel such as disclosed in U.S. Pat. No. 3,846,590, the disclosure of which is incorporated herein by reference, or on any other type of panel wherein there is easy access to the back side of the panel. These holes are also provided to accept a printed circuit board that can be screwed on base of block, making contact with preinstalled conductive elements at the tang 26 thus creating a precircuited unit.

This invention fulfills the growing need for quick-connect blocks that are small, easily mounted and can be fit into console wiring where a rack or panel mounted block is very often needed. The combination of two of these blocks in interlocking relationship permits the addition of a maximum number of connectors in a minimum amount of space.

FIG. 9 shows a prewired modular connecting block 51 including an upper block portion 52 and a base 53. Upper block portion 52 is a block of a type similar to that described with respect to FIGS. 1–8. The circuit block shown in FIG. 9 differs from the previously described circuit blocks in that the conductive element 20 shown in FIG. 8 is no longer used. Rather, circuit block 51 includes at least two rows of independent elements 54 and 55. If element 20 shown in FIG. 8 were cut at its base to sever the left hand portion of the element, an independent element such as elements 54 and 55 would be provided. Base 53 includes a plurality of connectors 56, 57, 58 and 59 which allow for connection of wires from a cable. The base also includes attachment holes 60 and 61 which allow the base 53 to be attached to a supporting surface such as the wall of a building. The opposite side of the base includes securement holes 62 and 63 which serve the same purposes as holes 60 and 61.

As best shown in FIG. 10, base 53 includes three attachment holes 64, 65 and 66 which align with protruding securing means 42 and a securing protrusion 36 which is not shown in FIG. 9 but which is shown in FIG. 4. Base 53 includes a rectangular recess 67. Protruding upwardly from recess 67 are two parallel walls 68 and 69 which prevent the movement of the tangs of elements 54 and 55 outwardly with respect to one another when the upper portion 52 is secured to base 53. If the tangs from elements 54 and 55 are allowed to move outwardly with respect to one another, the contact fingers of the respective elements may touch, thus making an undesirable electrical contact or short circuit. As shown in FIG. 10, the tangs of elements 54 and 55 allow for connection of wires by a conventional wire wrap technique. Connectors 56, 57, 58 and 59 are preferably made of metal and have extending therefrom wires which are wire wrapped to various tangs. It should also be understood that the tangs can be wired with respect to one another in any desired manner. Thus, as can be seen in FIGS. 10, 11 and 12, block 53 can be wired in any manner desired. The abbreviations T, R, L, LG and G as shown in FIGS. 10, 11 and 12, are conventional abbreviations for tip, ring, light, light-ground and ground. It should be understood that the circuit patterns shown are exemplary of the many possible prewired circuit patterns. A technician installing a modular connecting block can choose from any number of different prewired blocks to avoid wiring the block in the field. Base 53 also includes access gaps 71 and 72 which match with access gaps on the bottom of upper portion 51. Gaps 71 and 72 provide a space for wire wrapped tails.

FIG. 14 shows a prewired modular connecting block wherein rather than using individual wires to connect the tangs, a printed circuit board is used. The upper portion 52 of the circuit block is modified to provide a gap 73 which allows for tongue 74 of printed circuit board 75 to protrude therethrough. Printed circuit board 75 fits within the upper portion 52. More particularly, printed circuit board 75 fits within a recess defined by an outer edge similar to edge 32 as described with respect to FIG. 4. As shown in FIGS. 13 and 14, printed circuit board 75 includes a plurality of contacts 76, 77, 78 and 79 which may be connected to a cable. Circuit board 75 also includes a plurality of apertures 80 which allow for the interfitting of tangs of elements 54 and 55. Connectors 76, 77, 78 and 79 may be connected to the printed circuitry 81 in the patterns shown in FIGS. 11, 12 or 13 or in any other desired pattern. With the use of printed circuit board 75, securement means 46 as shown in FIG. 4 may be omitted so that a circuit board 75, having a generally rectangular shape, may be fitted within the recess defined by edge 32 as shown in FIG. 4.

FIG. 14 shows a manner in which printed circuit board 75 is secured to upper portion 52. Retainer plate 82 has a generally planar surface which abuts the edge of upper portion 52. Retainer plate 82 is provided with securement means 83 which align with securement means 42. When retainer plate 82 is affixed to upper portion 52, printed circuit board 75 is firmly maintained in place and connected to elements 54 and 55. With the prewired circuit block shown in FIG. 14, apertures 72 and 71 may be omitted.

Also, as shown in FIG. 14, the circuit blocks of the present invention may optionally include cover 84 which is shaped to fit over elements 55 and 56 so as to protect these elements from moisture and debris. Protruding downwardly from cover 84 is a retaining arm 85 which includes retaining lip 86. Retaining arm 85 fits through a gap similar to the gap 34 shown in FIG. 4 and retaining lip 86 releasably engages the edge provided by the gap.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

1. A modular connecting block comprising:

a housing, said housing being formed from a dielectric material and including:

a body portion, said body portion having a generally parallelepiped shape, said body portion further having a plurality of slots formed in a first planar face thereof, said slots extending part way through said body portion, said body portion further having a plurality of apertures extending inwardly from a second face thereof spaced from said first face portion, said apertures communicating with said slots;

a base portion integral with said body portion in the vicinity of said second face, said base portion and said second face cooperating to define a recessed area adjacent said second face, said base portion also extending outwardly with respect to a third face of said body portion to define a first projecting flange, said third face extending between and being generally perpendicular to said first and second faces, said first projecting flange having a recess disposed a preselected distance inwardly from a first end of the flange, said first flange also having an apertured securing protrusion extending outwardly therefrom, said apertured protrusion being spaced from a second end of said first flange by the same distance said recess is spaced from the first end of said first flange, the width of said protrusion in the direction from the first to second ends of said first flange being less than the width of said recess in said first flange, and the height of said protrusions in the direction perpendicular to that width being less than the height of said first flange; and

at least a second apertured securing protrusion extending outwardly from said base portion;

a plurality of electrically conductive contact members, said contact members being disposed in at least some of said slots in said housing body portion, said contact members each including:

a flat support portion having a pair of oppositely disposed edges;

at least one pair of oppositely disposed contact fingers projecting upwardly from and being integral with a first edge of said support portion; and

a tang extending from the said second edge of said support portion, said tang being coplanar with said support portion and extending through one of said apertures into the said recessed area adjacent said body portion second face, said tang being engaged by said housing body portion to thereby retain the contact element in said housing with said fingers extending above the said first face portion of said housing body portion.

2. The connecting block of claim 1 wherein said contact element tangs are provided with portions having a cross-sectional area greater than the cross-sectional area of the apertures which extend between the second face of said housing body portion and the base of the slots therein, said tang portions of increased cross-sectional area being positioned in said recessed area and against said second face.

3. The connecting block of claim 2 wherein at least some of said contact elements further comprise a second pair of opposed contact fingers extending from said supporting portion first edge in the same direction as the first pair of fingers.

4. The connecting block of claim 1 wherein said contact element tangs are captured in said housing body portion by means of frictional engagement.

5. The connecting block of claim 4 wherein at least some of said contact elements further comprise a second pair of opposed contact fingers extending from said supporting portion first edges in the direction of said first pair of fingers.

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